

### Trend Study 17-60-02

Study site name: Center Creek.

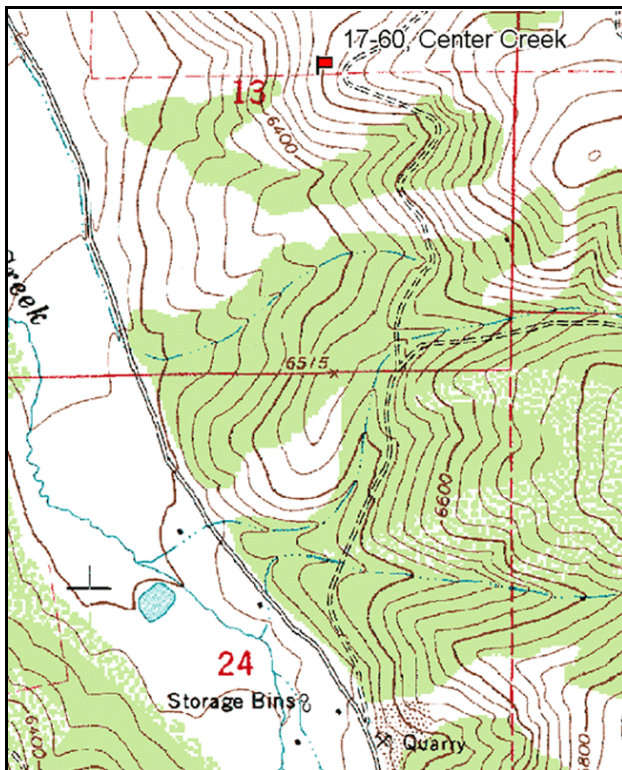
Vegetation type: Mountain Big Sage.

Compass bearing: frequency baseline 170 degrees magnetic.

Frequency belt placement: line 1 (11 & 95 ft), line 2 (34 ft), line 3 (59 ft), line 4 (71 ft). Rebar: belt 4 on 1 ft.

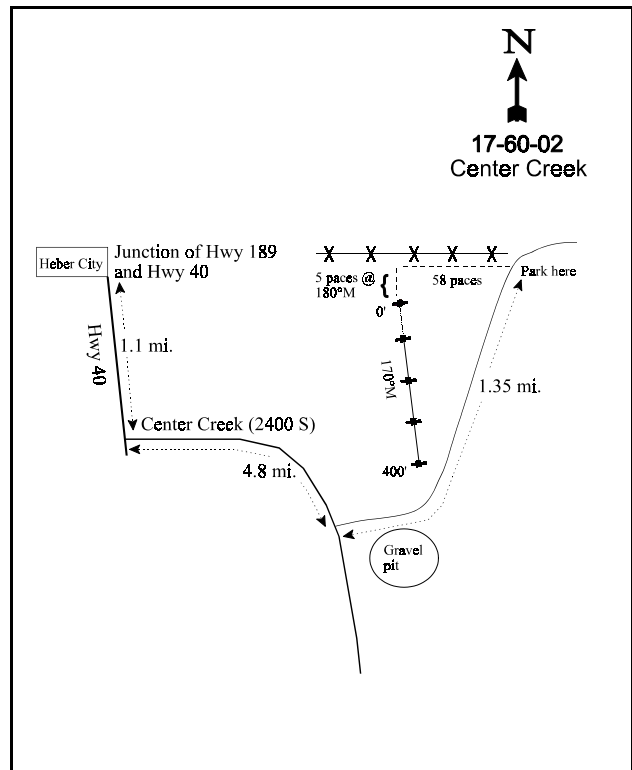
### LOCATION DESCRIPTION

From Heber City, proceed on Highway 40 towards Daniel's Canyon for 1.1 miles to Center Creek Road (2400 South). Go 3.0 miles until the road changes to a gravel road. Continue for another 1.8 miles to a gravel pit. Turn left and go 1.35 miles to a fence line, park here. Go 58 paces down the fence line. The 0-foot stake is 25 feet south of the fence line marked by browse tag # 174.



Map Name: Center Creek.

Township 4S, Range 5E, Section 13



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4479869 N 472366 E

## DISCUSSION

### Center Creek - Trend Study No. 17- 60

The Center Creek trend study was established in 2002 to monitor increasingly important winter range on the east foothills of the Heber Valley. The site supports a moderately high density of sagebrush with small numbers of bitterbrush and cliffrose. The study area has a moderate slope of 24% with a west aspect. Elevation is about 6,600 feet. The area receives winter use by deer and elk. A pellet group transect read on site in 2002 estimated 117 deer and 5 elk days use/acre (289 ddu/ha and 13 edu/ha). Most of the deer and elk pellet groups appear to be from winter use with a few from late winter and early spring. One lone juniper on site showed signs of being a rub tree for deer bucks or elk bulls. In addition, a dead deer carcass was found near the study site baseline. There was also some sign of horses using the area.

Soil on the site is moderately deep with an effective rooting depth of nearly 13 inches. Soils are rocky both on the surface and throughout the profile. In some areas there is a calcium carbonate layer 4 to 6 inches below the surface and many rocks have a calcium carbonate layer on them. Soil texture is a clay loam with a neutral reaction (pH of 7.0). The soil surface contains abundant rock and pavement cover. Bare soil is exposed mostly on trails which crisscross the site. Otherwise the surface is armored and erosion is minimal. The erosion condition class was determined to be slight in 2002.

The browse component is dominated by big sagebrush. Some of the sagebrush have characteristics of basin big sagebrush (*Artemisia tridentata tridentata*) while others are more like mountain big sagebrush (*Artemisia tridentata vaseyana*). There is obviously some hybridization between these two subspecies of sagebrush. There was also differential use with heavier use noted on individuals with more mountain big sagebrush characteristics. For simplification of the data, all of the sagebrush on the site was classified as mountain big sagebrush and overall use was classified as moderate to heavy. The population was estimated at just over 3,000 plants/acre in 2002. Most of the plants are mature (70%) with about one-third being decadent. No seedlings were encountered and young plants account for only 2% of the population. Dead plants were common and 74% of the decadent plants were classified as dying (>50% crown death). Mature plants exhibit normal vigor with annual leader growth averaging 2.7 inches in 2002.

Other preferred species occur in limited numbers. These include serviceberry, an occasional cliffrose, and a small population of bitterbrush. All of these species displayed extremely heavy use with a clubbed growth form on available plants. Broom snakeweed is abundant with a population estimated at 3,620 plants/acre. The population is mostly mature with good vigor.

The herbaceous understory is diverse but not particularly productive. The annuals, cheatgrass and Japanese brome, dominate the herbaceous understory by providing 53% of the total grass cover or 39% of the total herbaceous cover. Common perennial grasses include bluebunch wheatgrass and Indian ricegrass. Forbs are diverse with 28 species sampled in 2002. However, all species combined produce only about 3% total cover. The most abundant forb is the annual, pale alyssum. The most abundant perennial forbs are poor value forage species, hairy goldaster and heath aster.

### 2002 APPARENT TREND ASSESSMENT

Soil conditions are marginal. Most of the ground surface is protected by rock and litter cover but some erosion is still occurring and herbaceous vegetation cover is limited. The erosion condition class was determined to be slight in 2002. The sagebrush population appears to be in a state of decline. The current population is mostly mature with moderate to heavy use. Decadent plants account for 28% of the population and 74% of those were classified as dying. Recruitment is poor and not adequate to maintain the current population. Dead plants are common and it appears that the population will continue this state of decline in the future. The herbaceous understory is diverse but not productive. Total herbaceous cover is estimated at only 11%. The annuals, cheatgrass and Japanese brome provide most of the grass cover, and the forb component is dominated by annuals and poor value perennials.

HERBACEOUS TRENDS --  
Herd unit 17 , Study no: 60

| T<br>y<br>p<br>e            | Species                    | Nested<br>Frequency<br><br>'02 | Quadrat<br>Frequency<br><br>'02 | Average<br>Cover %<br><br>'02 |
|-----------------------------|----------------------------|--------------------------------|---------------------------------|-------------------------------|
| G                           | Agropyron dasystachyum     | 5                              | 3                               | .18                           |
| G                           | Agropyron spicatum         | 37                             | 15                              | 1.02                          |
| G                           | Bromus japonicus (a)       | 185                            | 63                              | 1.25                          |
| G                           | Bromus tectorum (a)        | 217                            | 72                              | 3.11                          |
| G                           | Oryzopsis hymenoides       | 39                             | 20                              | 1.65                          |
| G                           | Poa bulbosa                | 1                              | 1                               | .00                           |
| G                           | Poa fendleriana            | 23                             | 10                              | .12                           |
| G                           | Poa pratensis              | 10                             | 4                               | .09                           |
| G                           | Poa secunda                | 42                             | 16                              | .39                           |
| G                           | Sitanion hystrix           | 32                             | 13                              | .29                           |
| G                           | Stipa comata               | 2                              | 2                               | .06                           |
| Total for Annual Grasses    |                            | 402                            | 135                             | 4.36                          |
| Total for Perennial Grasses |                            | 191                            | 84                              | 3.84                          |
| Total for Grasses           |                            | 593                            | 219                             | 8.21                          |
| F                           | Agoseris glauca            | 6                              | 2                               | .03                           |
| F                           | Alyssum alyssoides (a)     | 175                            | 69                              | .76                           |
| F                           | Allium spp.                | 47                             | 19                              | .10                           |
| F                           | Antennaria rosea           | 6                              | 2                               | .15                           |
| F                           | Arabis spp.                | 1                              | 1                               | .00                           |
| F                           | Artemisia ludoviciana      | 3                              | 2                               | .01                           |
| F                           | Astragalus convallarius    | 3                              | 1                               | .00                           |
| F                           | Castilleja linariaefolia   | 3                              | 2                               | .06                           |
| F                           | Camelina microcarpa (a)    | 5                              | 2                               | .01                           |
| F                           | Calochortus nuttallii      | 13                             | 8                               | .04                           |
| F                           | Chaenactis douglasii       | 4                              | 1                               | .00                           |
| F                           | Chenopodium spp. (a)       | 3                              | 1                               | .03                           |
| F                           | Cirsium spp.               | 7                              | 5                               | .07                           |
| F                           | Collomia linearis (a)      | 5                              | 2                               | .01                           |
| F                           | Cymopterus spp.            | 15                             | 7                               | .06                           |
| F                           | Epilobium brachycarpum (a) | 20                             | 9                               | .04                           |
| F                           | Eriogonum brevicaulis      | 1                              | 1                               | .00                           |
| F                           | Erodium cicutarium (a)     | 20                             | 6                               | .08                           |
| F                           | Eriogonum racemosum        | 4                              | 2                               | .03                           |
| F                           | Gilia spp. (a)             | 1                              | 1                               | .00                           |
| F                           | Helianthus annuus (a)      | 2                              | 2                               | .01                           |
| F                           | Heterotheca villosa        | 32                             | 16                              | .41                           |
| F                           | Leucelene ericoides        | 19                             | 7                               | .52                           |

| T<br>y<br>p<br>e          | Species                  | Nested<br>Frequency<br><br>'02 | Quadrat<br>Frequency<br><br>'02 | Average<br>Cover %<br><br>'02 |
|---------------------------|--------------------------|--------------------------------|---------------------------------|-------------------------------|
| F                         | Microsteris gracilis (a) | 27                             | 11                              | .13                           |
| F                         | Phlox longifolia         | 18                             | 8                               | .06                           |
| F                         | Sphaeralcea coccinea     | 20                             | 7                               | .28                           |
| F                         | Viguiera multiflora      | 3                              | 2                               | .03                           |
| Total for Annual Forbs    |                          | 258                            | 103                             | 1.07                          |
| Total for Perennial Forbs |                          | 205                            | 93                              | 1.90                          |
| Total for Forbs           |                          | 463                            | 196                             | 2.98                          |

#### BROWSE TRENDS --

Herd unit 17 , Study no: 60

| T<br>y<br>p<br>e | Species                                      | Strip<br>Frequency<br><br>'02 | Average<br>Cover %<br><br>'02 |
|------------------|--|-------------------------------|-------------------------------|
| B                | Amelanchier alnifolia                        | 7                             | .41                           |
| B                | Artemisia tridentata vaseyana                | 76                            | 21.50                         |
| B                | Chrysothamnus viscidiflorus<br>viscidiflorus | 3                             | .15                           |
| B                | Gutierrezia sarothrae                        | 38                            | 1.99                          |
| B                | Mahonia repens                               | 5                             | .45                           |
| B                | Opuntia spp.                                 | 31                            | .28                           |
| B                | Purshia tridentata                           | 8                             | .30                           |
| B                | Tetradymia canescens                         | 15                            | .59                           |
| Total for Browse |  | 183                           | 25.68                         |

#### CANOPY COVER -- LINE INTERCEPT

Herd unit 17 , Study no: 60

| Species                                      | Percent<br>Cover<br><br>'02 |
|--|-----------------------------|
| Amelanchier utahensis                        | .02                         |
| Artemisia tridentata vaseyana                | 20.67                       |
| Chrysothamnus viscidiflorus<br>viscidiflorus | .17                         |
| Gutierrezia sarothrae                        | 2.17                        |
| Mahonia repens                               | .33                         |
| Opuntia spp.                                 | .17                         |
| Purshia tridentata                           | .50                         |
| Tetradymia canescens                         | .92                         |

# Key Browse Annual Leader Growth

Herd unit 17 , Study no: 60

| Species                       | Average leader growth (in)<br>'02 |
|-------------------------------|-----------------------------------|
| Artemisia tridentata vaseyana | 2.7                               |

# BASIC COVER --

Herd unit 17 , Study no: 60

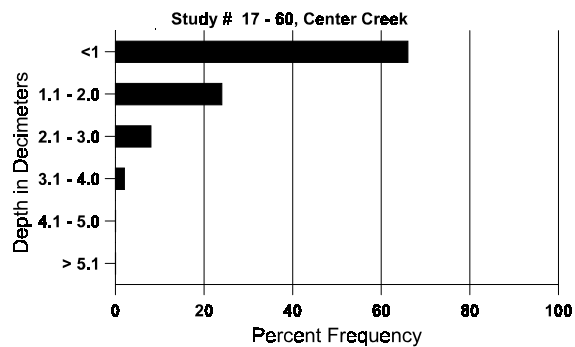
| Cover Type  | Nested Frequency<br>'02 | Average Cover %<br>'02 |
|-------------|-------------------------|------------------------|
| Vegetation  | 368                     | 36.21                  |
| Rock        | 335                     | 18.43                  |
| Pavement    | 353                     | 12.66                  |
| Litter      | 451                     | 33.97                  |
| Cryptogams  | 12                      | .22                    |
| Bare Ground | 318                     | 15.71                  |

# SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 60, Center Creek

| Effective rooting depth (in) | Temp °F (depth) | pH  | %sand | %silt | %clay | %OM | PPM P | PPM K | dS/m |
|------------------------------|-----------------|-----|-------|-------|-------|-----|-------|-------|------|
| 12.5                         | 67.0<br>(12.7)  | 7.0 | 41.3  | 24.7  | 34.0  | 4.3 | 16.4  | 278.4 | .7   |

# Stoniness Index



# PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 60

| Type   | Quadrat Frequency<br>'02 | Pellet Transect               |                               |
|--------|--------------------------|-------------------------------|-------------------------------|
|        |                          | Pellet Groups per Acre<br>'02 | Days Use per Acre (ha)<br>'02 |
| Rabbit | 7                        | -                             | -                             |
| Elk    | 1                        | 70                            | 5 (13)                        |
| Deer   | 27                       | 1523                          | 117 (289)                     |
| Cattle | 1                        | -                             | -                             |

## BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 60

| A<br>G<br>R<br>E                               | Y<br>R | Form Class (No. of Plants) |    |    |                         |   |   |                          |   |   | Vigor Class    |      |      |     | Plants<br>Per Acre | Average<br>(inches)<br>Ht. Cr. |     | Total |
|--|--------|----------------------------|----|----|-------------------------|---|---|--------------------------|---|---|----------------|------|------|-----|--------------------|--------------------------------|-----|-------|
|  |        | 1                          | 2  | 3  | 4                       | 5 | 6 | 7                        | 8 | 9 | 1              | 2    | 3    | 4   |                    |                                |     |       |
| Amelanchier alnifolia                          |        |                            |    |    |                         |   |   |                          |   |   |                |      |      |     |                    |                                |     |       |
| Y  | 02     | -                          | -  | 1  | -                       | - | 1 | -                        | - | - | 2              | -    | -    | -   | 40                 |                                | 2   |       |
| M  | 02     | -                          | -  | 2  | -                       | 1 | 3 | -                        | - | - | 6              | -    | -    | -   | 120                | 17 27                          | 6   |       |
| % Plants Showing '02                           |        | <u>Moderate Use</u><br>13% |    |    | <u>Heavy Use</u><br>88% |   |   | <u>Poor Vigor</u><br>00% |   |   | <u>%Change</u> |      |      |     |                    |                                |     |       |
| Total Plants/Acre (excluding Dead & Seedlings) |        |                            |    |    |                         |   |   |                          |   |   | '02            | 160  | Dec: | -   |                    |                                |     |       |
| Artemisia tridentata vaseyana                  |        |                            |    |    |                         |   |   |                          |   |   |                |      |      |     |                    |                                |     |       |
| Y  | 02     | 2                          | 1  | -  | -                       | - | - | -                        | - | - | 3              | -    | -    | -   | 60                 |                                | 3   |       |
| M  | 02     | 51                         | 37 | 17 | -                       | - | - | -                        | - | - | 105            | -    | -    | -   | 2100               | 28 39                          | 105 |       |
| D  | 02     | 15                         | 10 | 17 | 1                       | - | - | -                        | - | - | 11             | -    | -    | 32  | 860                |                                | 43  |       |
| X  | 02     | -                          | -  | -  | -                       | - | - | -                        | - | - | -              | -    | -    | -   | 1000               |                                | 50  |       |
| % Plants Showing '02                           |        | <u>Moderate Use</u><br>32% |    |    | <u>Heavy Use</u><br>23% |   |   | <u>Poor Vigor</u><br>21% |   |   | <u>%Change</u> |      |      |     |                    |                                |     |       |
| Total Plants/Acre (excluding Dead & Seedlings) |        |                            |    |    |                         |   |   |                          |   |   | '02            | 3020 | Dec: | 28% |                    |                                |     |       |
| Chrysothamnus viscidiflorus viscidiflorus      |        |                            |    |    |                         |   |   |                          |   |   |                |      |      |     |                    |                                |     |       |
| M  | 02     | 3                          | -  | -  | -                       | - | - | -                        | - | - | 2              | -    | 1    | -   | 60                 | 9 16                           | 3   |       |
| % Plants Showing '02                           |        | <u>Moderate Use</u><br>00% |    |    | <u>Heavy Use</u><br>00% |   |   | <u>Poor Vigor</u><br>33% |   |   | <u>%Change</u> |      |      |     |                    |                                |     |       |
| Total Plants/Acre (excluding Dead & Seedlings) |        |                            |    |    |                         |   |   |                          |   |   | '02            | 60   | Dec: | -   |                    |                                |     |       |
| Cowania mexicana stansburiana                  |        |                            |    |    |                         |   |   |                          |   |   |                |      |      |     |                    |                                |     |       |
| M  | 02     | -                          | -  | -  | -                       | - | - | -                        | - | - | -              | -    | -    | -   | 0                  | 85 67                          | 0   |       |
| % Plants Showing '02                           |        | <u>Moderate Use</u><br>00% |    |    | <u>Heavy Use</u><br>00% |   |   | <u>Poor Vigor</u><br>00% |   |   | <u>%Change</u> |      |      |     |                    |                                |     |       |
| Total Plants/Acre (excluding Dead & Seedlings) |        |                            |    |    |                         |   |   |                          |   |   | '02            | 0    | Dec: | -   |                    |                                |     |       |
| Gutierrezia sarothrae                          |        |                            |    |    |                         |   |   |                          |   |   |                |      |      |     |                    |                                |     |       |
| M  | 02     | 171                        | -  | -  | -                       | - | - | -                        | - | - | 171            | -    | -    | -   | 3420               | 8 10                           | 171 |       |
| D  | 02     | 10                         | -  | -  | -                       | - | - | -                        | - | - | 2              | 1    | 1    | 6   | 200                |                                | 10  |       |
| X  | 02     | -                          | -  | -  | -                       | - | - | -                        | - | - | -              | -    | -    | -   | 180                |                                | 9   |       |
| % Plants Showing '02                           |        | <u>Moderate Use</u><br>00% |    |    | <u>Heavy Use</u><br>00% |   |   | <u>Poor Vigor</u><br>04% |   |   | <u>%Change</u> |      |      |     |                    |                                |     |       |
| Total Plants/Acre (excluding Dead & Seedlings) |        |                            |    |    |                         |   |   |                          |   |   | '02            | 3620 | Dec: | 6%  |                    |                                |     |       |
| Mahonia repens                                 |        |                            |    |    |                         |   |   |                          |   |   |                |      |      |     |                    |                                |     |       |
| M  | 02     | 113                        | -  | -  | -                       | - | - | -                        | - | - | 113            | -    | -    | -   | 2260               | 3 4                            | 113 |       |
| % Plants Showing '02                           |        | <u>Moderate Use</u><br>00% |    |    | <u>Heavy Use</u><br>00% |   |   | <u>Poor Vigor</u><br>00% |   |   | <u>%Change</u> |      |      |     |                    |                                |     |       |
| Total Plants/Acre (excluding Dead & Seedlings) |        |                            |    |    |                         |   |   |                          |   |   | '02            | 2260 | Dec: |     |                    |                                |     |       |

| A<br>G<br>E                                    | Y<br>R | Form Class (No. of Plants) |   |   |                          |   |   |                          |   |   | Vigor Class    |   |   |     | Plants<br>Per Acre | Average<br>(inches)<br>Ht. Cr. | Total |
|--|--------|----------------------------|---|---|--------------------------|---|---|--------------------------|---|---|----------------|---|---|-----|--------------------|--------------------------------|-------|
|  |        | 1                          | 2 | 3 | 4                        | 5 | 6 | 7                        | 8 | 9 | 1              | 2 | 3 | 4   |                    |                                |       |
| Opuntia spp.                                   |        |                            |   |   |                          |   |   |                          |   |   |                |   |   |     |                    |                                |       |
| Y  | 02     | 6                          | - | - | -                        | - | - | -                        | - | - | 6              | - | - | -   | 120                |                                | 6     |
| M  | 02     | 44                         | - | - | 3                        | - | - | -                        | - | - | 46             | 1 | - | -   | 940                | 4 8                            | 47    |
| D  | 02     | 1                          | - | - | -                        | - | - | -                        | - | - | -              | - | - | 1   | 20                 |                                | 1     |
| % Plants Showing '02                           |        | <u>Moderate Use</u><br>00% |   |   | <u>Heavy Use</u><br>00%  |   |   | <u>Poor Vigor</u><br>02% |   |   | <u>%Change</u> |   |   |     |                    |                                |       |
| Total Plants/Acre (excluding Dead & Seedlings) |        |                            |   |   |                          |   |   |                          |   |   |                |   |   | '02 | 1080               | Dec:                           | 2%    |
| Purshia tridentata                             |        |                            |   |   |                          |   |   |                          |   |   |                |   |   |     |                    |                                |       |
| M  | 02     | -                          | - | 3 | -                        | - | 3 | -                        | - | 1 | 7              | - | - | -   | 140                | 9 26                           | 7     |
| D  | 02     | -                          | - | - | -                        | - | 1 | -                        | - | - | 1              | - | - | -   | 20                 |                                | 1     |
| % Plants Showing '02                           |        | <u>Moderate Use</u><br>00% |   |   | <u>Heavy Use</u><br>100% |   |   | <u>Poor Vigor</u><br>00% |   |   | <u>%Change</u> |   |   |     |                    |                                |       |
| Total Plants/Acre (excluding Dead & Seedlings) |        |                            |   |   |                          |   |   |                          |   |   |                |   |   | '02 | 160                | Dec:                           | 13%   |
| Rhus trilobata                                 |        |                            |   |   |                          |   |   |                          |   |   |                |   |   |     |                    |                                |       |
| M  | 02     | -                          | - | - | -                        | - | - | -                        | - | - | -              | - | - | -   | 0                  | 27 51                          | 0     |
| % Plants Showing '02                           |        | <u>Moderate Use</u><br>00% |   |   | <u>Heavy Use</u><br>00%  |   |   | <u>Poor Vigor</u><br>00% |   |   | <u>%Change</u> |   |   |     |                    |                                |       |
| Total Plants/Acre (excluding Dead & Seedlings) |        |                            |   |   |                          |   |   |                          |   |   |                |   |   | '02 | 0                  | Dec:                           | -     |
| Tetradymia canescens                           |        |                            |   |   |                          |   |   |                          |   |   |                |   |   |     |                    |                                |       |
| M  | 02     | 15                         | 1 | 1 | -                        | - | - | -                        | - | - | 17             | - | - | -   | 340                | 10 16                          | 17    |
| D  | 02     | 1                          | - | - | -                        | - | - | -                        | - | - | 1              | - | - | -   | 20                 |                                | 1     |
| % Plants Showing '02                           |        | <u>Moderate Use</u><br>06% |   |   | <u>Heavy Use</u><br>06%  |   |   | <u>Poor Vigor</u><br>00% |   |   | <u>%Change</u> |   |   |     |                    |                                |       |
| Total Plants/Acre (excluding Dead & Seedlings) |        |                            |   |   |                          |   |   |                          |   |   |                |   |   | '02 | 360                | Dec:                           | 6%    |